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GEOLOGY OF THE SOUTHERN RIDGE BASIN

LOS ANGELES COUNTY, CALIFORNIA

By PETER DEHLINGER

With a Section on Economic Geology
By Charles W. Jennings

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GEOLOGY OF THE SOUTHERN RIDGE BASIN, LOS ANGELES COUNTY, CALIFORNIA

By Peter Dehlinger *

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ABSTRACT

The marine Modelo formation and the overlying non-marine idge Route formation, as exposed in the southern part of the idge Basin, are similar in general appearance and consist of lternating beds of sandstone and siltstone. The contact between he formations is not a sharp break. Interfingering of the two edimentary units was not observed, but such interbedding may xist. The two formations differ in strike by as much as 35 degrees n the area studied, although the strike changes uniformly from ne formation to the other. This difference in attitude is believed o be a depositional feature, rather than one resulting from struc-ural disturbance.

The Modelo formation thins markedly in a northerly direction, nd the sea in which it was formed appears to have transgressed he area from south to north during a part of upper Miocene time. ubsequently the sea retreated from the area, and non-marine idge Route beds were probably deposited concomitantly from a ortherly direction. There is no evidence of a considerable time apse between the periods of marine and non-marine deposition. The lowermost beds of the Ridge Route formation may be fluviatile, ut the remainder of the formation appears to be of lacustrine origin. n post-Pliocene time the region was folded into the asymmetrically ynclinal Ridge Basin. The folding probably was related to dis-lacements along the adjacent San Gabriel fault.

INTRODUCTION

The Ridge Basin, named by Eaton (1929, fig. 5 and p. 750), is a northwestward trending structural basin between the San Gabriel and San Andreas fault zones in the Transverse Ranges province of California. The rocks in the basin consist of marine upper Miocene sedimentary rocks and an overlying, considerably thicker series of non-marine deposits. The marine and non-marine beds are lithologically similar and appear to be conformable. During the present investigations, an attempt was made to determine the nature and sequence of events that affected these beds during upper Miocene and post-Miocene time.

The area studied is in the southern part of the Ridge Basin (fig. 1) north of Castaic, a town on U. S. Highway 99 about 45 miles north of Los Angeles. A northwest-trending area about 9 miles long and 3 miles wide was mapped in detail. Most of the area lies within the Violin Canyon quadrangle, Los Angeles County, and small parts of it lie in the adjacent Redrock Mountain and Whitaker Peak quadrangles.

Some of the first detailed mapping in the area was done by Clements, whose findings are presented in a Ph.D. thesis (1932), and as a shorter published paper (1937). Eaton (1939) published the results in a reconnaissance study of the Ridge Basin. In 1947 students of a geological field camp of the California Institute of Technology mapped in detail the geology of the Red Mountain quadrangle, adjoining the Violin Canyon quadrangle on the east. The results of this work have not yet been published. During the early 1930's a similar field camp was operated with headquarters at Sandberg, approximately 10 miles north of the area included in this paper. Drs. J. P. Buwalda and F. D. Bode, directors of that camp, have discussed their findings with the writer.

Field mapping in the present study was done on aerial photographs (scale, 1″=1666′ approx.). The field data were transferred by inspection from the photographs to topographic quadrangle sheets (scale, 1:24000).

Acknowledgments. Sincere appreciation is expressed to R. H. Jahns of the California Institute of Technology, who made many valuable suggestions. Ideas contributed by J. P. Buwalda of the California Institute of Technology, F. D. Bode of The Texas Company, and M. C. Israelsky of the United States Geological Survey, facilitated the investigations. Microfaunal analyses were made by The Texas Company, and identifications of various megafossils were kindly contributed by J. W. Durham of the University of California. W. H. Corey of the Continental Oil Company kindly reviewed the manuscript.

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* Battelle Memorial Institute. This report is a condensation of a Ph. D. minor thesis (contribution number 547 of the publications of the Division of the Geological Sciences, California Institute of Technology, Pasadena, California) submitted to the California Institute of Technology, June 1950. Manuscript received by the Division of Mines for publication August 1951.

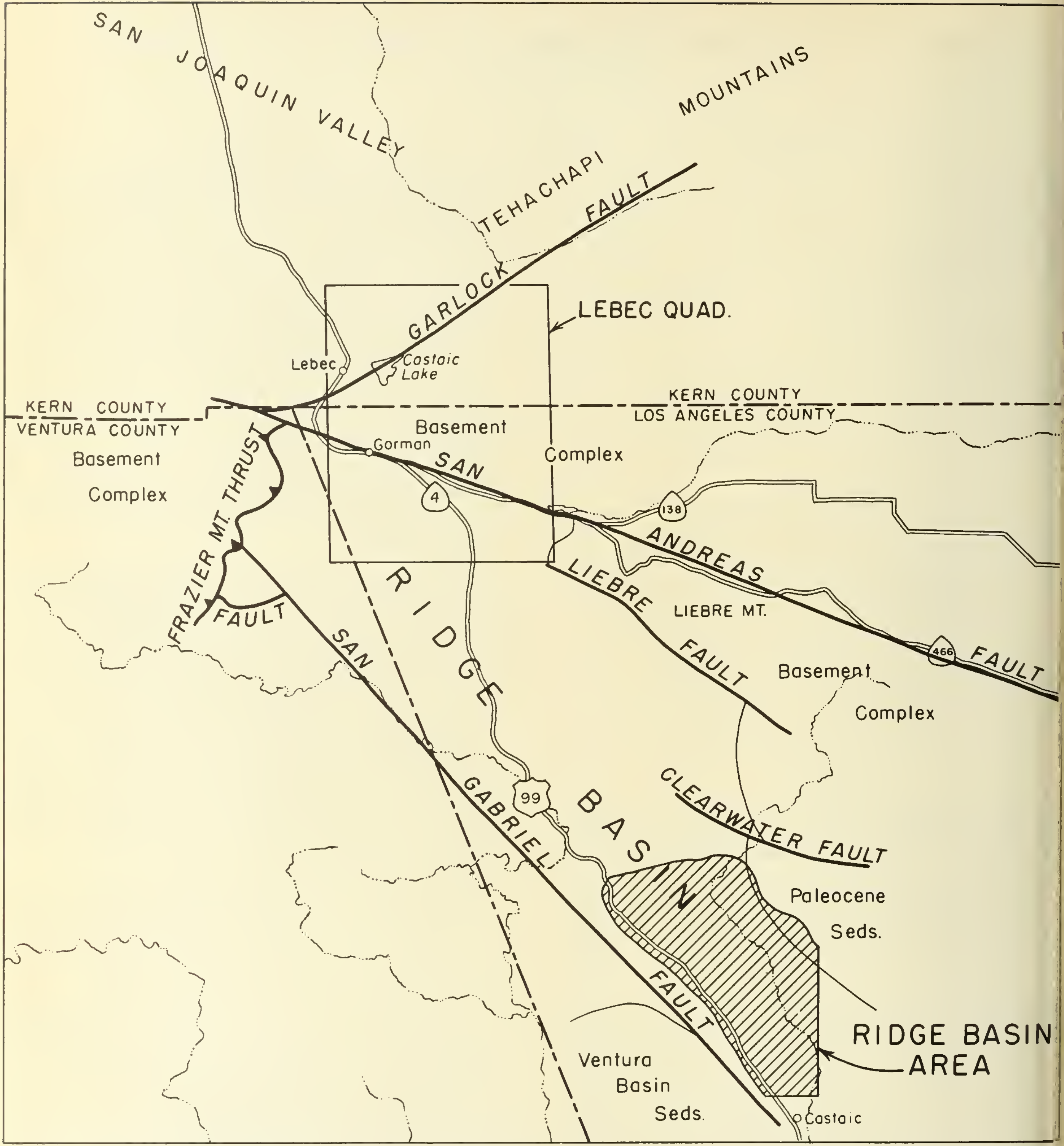

Figure 1. Index map showing location of southern Ridge Basin. The geology of the Lebec quadrangle, also shown, was discussed y John C. Crowell in California Division of Mines Special Report 24. Ridge Basin was a wedge-shaped depression during the late Cenozoic e, in which a remarkable thickness of predominantly non-marine rocks accumulated. Structurally the basin is a complex graben bounded n the southwest by the San Gabriel fault zone, on the northeast by the Liebre fault zone, on the north by the San Andreas fault zone, on e east by overlap onto crystalline basement and Paleocene-Eocene sedimentary rocks, and on the southeast by gradation into the eastern V- tura Basin. Owing to Pleistocene deformation the Ridge Basin beds have been squeezed into a northwest-plunging syncline between e relatively competent walls of the depression. Older rocks are therefore exposed at the southeast and younger at the northwest

STRATIGRAPHY

The two principal stratigraphic units in the southern part of the Ridge Basin are the Modelo formation (marine upper Miocene) and the Ridge Route formation (nonmarine upper Miocene or Pliocene). Both these units conist primarily of alternating beds of sandstone and silttone.

Igneous, metamorphic, and various sedimentary rocks are exposed beyond the area mapped. Most of them have been discussed by Clements (1932, 1937), and those in he Red Mountain quadrangle, east of the area, have been mapped in detail by members of the 1947 geological field amp of the California Institute of Technology. The folowing résumé is abstracted mainly from these two sources.

Metamorphic Rocks. Two series of metamorphic rocks re exposed in the southern Ridge Basin. One, the Pelona chist, consists of coarse, granular, micaceous schist of possible pre-Cambrian age; the other is comprised of gneiss, quartzite, and marble of possible Paleozoic age. The schist is exposed about 5 miles east of the southeastern border of the area, and the younger metamorphic rocks ppear both east and west of the area. They crop out 2 or 3 miles to the east, as well as about a mile to the west, where they are exposed on the west side of the San Gabriel fault.

Igneous Rocks. Igneous rocks in the southern part of he basin consist of Jurassic (?) intrusive types, predominantly of granodioritic composition. The rocks are xposed over a considerable area, and the nearest outcrops are 2 to 3 miles northeast and northwest of the rea investigated by the writer.

Sedimentary Rocks. All sedimentary rocks in the outhern Ridge Basin are of Cenozoic age. They comprise he following formations:

Saugus (Pleistocene)
Pico (Pliocene)
Ridge Route (upper Miocene or Pliocene)
Modelo (upper Miocene)
Mint Canyon (upper Miocene)
Temblor (middle Miocene)
Vaqueros (lower Miocene)
Sespe (Oligocene)
Domengine (middle Eocene)
Martinez (lower Eocene)

Martinez and Sespe beds are exposed both east and west f the area mapped. A narrow strip of the Mint Canyon ormation occurs just east of the area and the Domenne, Vaqueros, and Temblor formations crop out a few iles to the west. The Modelo formation is well exposed within the area, and extends beyond its north and west orders. To the west these beds are abruptly truncated y the San Gabriel fault, along which they are in conact with Pico beds and Paleozoic gneiss, quartzite, and marble. The Modelo formation also is exposed 1 to 2 miles est of this fault. The Ridge Route formation, also well posed in the area, becomes thicker in a northwesterly rection, toward the deepest part of the Ridge Basin Eaton, 1939). Pico and Saugus beds appear west and uth of the area. Modelo beds overlie the Martinez foration with an angular unconformity east and northeast of the area. Southeast of the area, Modelo beds overlie the Mint Canyon formation conformably in some places and unconformably in others.

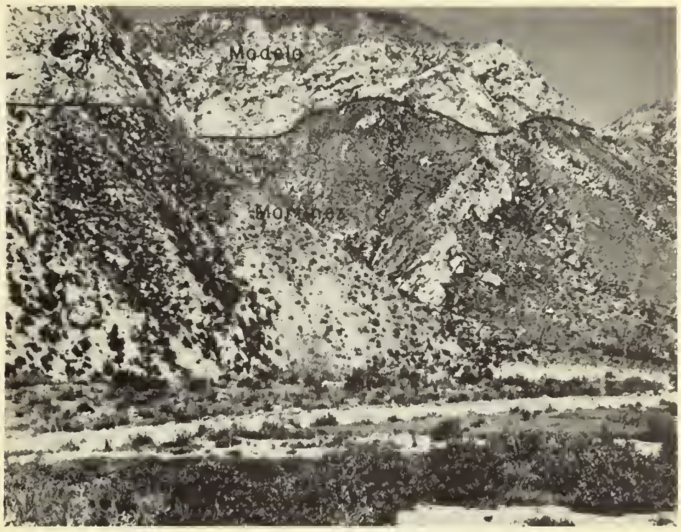

Figure 2. Basal Modelo conglomerate unconformably overlying the Martinez formation. Exposure near the junction of Castaic Creek and Fish Canyon. *Photo by C. W. Jennings, 1952.*

Modelo Formation (Upper Miocene)[1]

The term "Modelo," as used in this paper, denotes marine beds of upper Miocene age. The beds crop out in approximately three-quarters of the area mapped. A conglomeratic member, ranging from a few feet to nearly 300 feet in thickness, lies at the base of the formation (Clements, 1932). Boulders in this conglomerate consist of hard sandstone that is characteristic of the underlying Martinez formation, as well as quartzite, gneiss, and other rocks that represent the crystalline "basement complex." A conglomeratic pecten bed, ranging in thickness from a few inches to about 8 feet and containing many fragments of pectens and oysters, overlies the basal con-

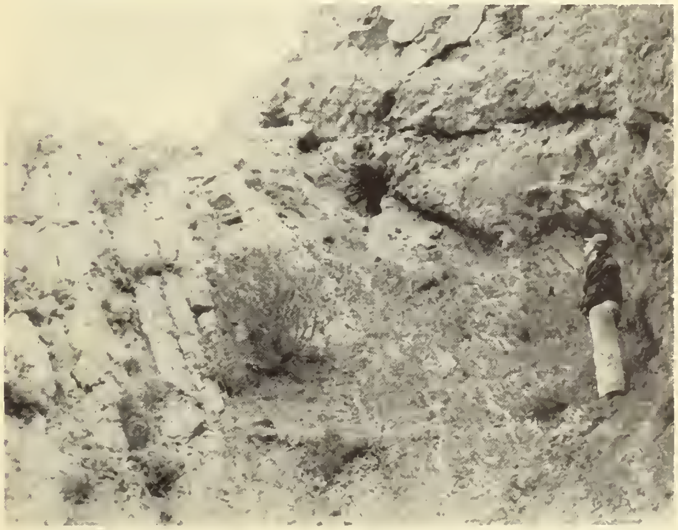

Figure 3. Close-up of unconformity shown in figure 2.

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[1] *Ed. Note:* Following Clements (1937) usage. In recent years the name "Castaic formation" has also been applied but without adequate definition.

glomerate. The bed serves as an excellent marker unit. The thick Modelo section above the pecten bed comprises alternating beds of sandstone, siltstone, and some shale.

The thickness of the Modelo formation decreases markedly and rather uniformly in a northerly direction. Approximately 6300 feet of the lower part of the formation is exposed in the southern part of the area, where upper Modelo beds have been removed by erosion. In contrast, the thickness of the entire formation in the northern part of the area is only 2000 feet. A reconnaissance north of the junction of Castaic and Fish Creeks indicates, however, that the Modelo beds do not pinch out or thin rapidly in the area farther north.

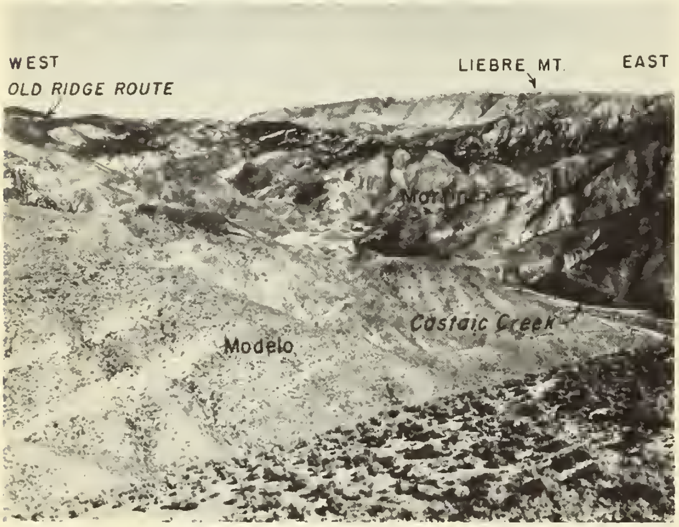


FIGURE 4. Portion of eastern flank of Ridge Basin syncline. Camera facing north. *Photo by C. W. Jennings, 1952.*

The Modelo beds have been folded into an asymmetrical, northwestward plunging syncline, with a gently dipping northeast flank and a much steeper dipping southwest flank. The fold is the southern part of the Ridge Basin, and is referred to by Clements (1932, 1937) as the Castaic syncline. U. S. Highway 99 extends along the axial part of this large fold. The San Gabriel fault (Palomas fault of Clements) is parallel to the synclinal axis, and lies about a mile west of it. The rocks exposed along the eastern flank of the syncline form the chief subject for discussion in this report.

The pecten bed that lies above the basal Modelo conglomerate is the oldest unit mapped in this study. The bed contains abundant fragments of *Aequipecten raymondi* and *Ostrea titan.* Other species of pectens also are reported from this horizon by Clements (1932). The rock is a coarse conglomeratic arkose with a calcareous cement; it is hard, well indurated, and has a limestonelike appearance. The unit is remarkably continuous, though it appears to pinch out locally.

The beds of Modelo sandstone, siltstone, and shale above the pecten bed are composed largely of subangular quartz fragments with varying proportions of biotite and feldspar. Biotite was observed in all these rocks, the largest quantities appearing in the siltstone and shale. Feldspar fragments are most abundant in the sandstone. The cement in the sandstone and siltstone appears to be calcareous and somewhat ferruginous. Numerous thin gypsum seams occur in many of the beds.

Thicknesses of the sandstone, siltstone, and shale beds commonly range from several inches to about five feet though a few beds are as much as 20 feet thick. The sandstone beds range in texture from fine and sugary to coarse and less even. In some places they are pebbly, and even contain conglomeratic stringers. Most are buff to brown or drab, and a few show a slightly reddish tinge. The colors of the siltstone beds are similar, but generally a little darker. The shale ranges from gray to dark bluish gray and in some places has a carbonaceous appearance. Perhaps the characteristic feature of the Modelo sandstone siltstone section is the rather monotonous sequence of bed that show alternations of texture but little variation i color or thickness.

Several stratigraphic sections of the Modelo formation lying above the pecten bed were made to determine the nature of thinning of the formation. From this study i was determined that the formation, approximately 2000 feet thick in the northern part of the area, probably wa more than 9000 feet thick in the southern part prior t erosion.

Although many poorly preserved fossils occur in som zones in the Modelo formation, most of the beds seem t be barren of such material. Foraminiferal remains ar uncommon but where found near the top of the formation proved helpful in locating the contact between the marin and overlying non-marine beds. Several sandstone bed in the lower part of the formation, exposed in the souther half of the area, contain abundant casts and molds o mollusks. Such remains are rare in the upper beds of th formation, which do, however, contain much fossil woo and charcoal. Several sandstone beds in the upper par of the formation contain evidence of penecontemporaneous deformation, indicating that slipping or flowing o the beds occurred in the unconsolidated deposits.

The fauna in the Modelo formation indicates depositio in upper Miocene time. Foraminiferal data further suggest deposition during the Mohnian stage, but probabl not during Delmontian time. Fauna identified from th Modelo beds in this area includes:

Ostrea titan **Conrad**
Aequipecten raymondi **Clark?**
Protocardia centifilosum **(Carpenter)**
Pecten **sp.**
Delectopecten **sp.**
Spigula **sp.**
Solen **sp.**
Anadara **sp.**
Crenella **sp.**
Cardium **sp.**
Radiolaria **sp.**
Haplophragmoides **sp.**
Diatoms
Foraminifera (probably Mohnian)
Fish bones

Ridge Route Formation (Upper Miocene or Pliocene)

The Ridge Route formation (Clements 1937) consis of a thick series of non-marine beds that overlie t Modelo strata in the Ridge Basin. The sediments ha also been described in a general way by Eaton (1939 who believes that they have a thickness of about 18,0 feet in the central part of the Ridge Basin.

The lowermost 5100 feet of the formation appears the area of the present study. This portion contains so

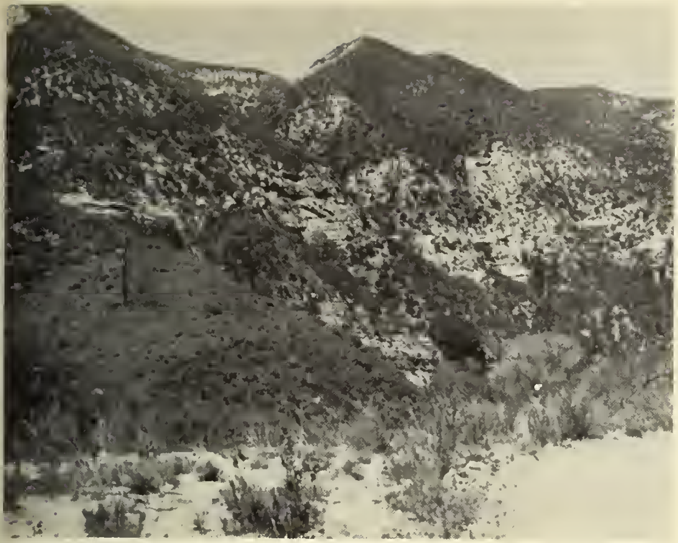


Figure 5. Exposure of Modelo sandstone and siltstone beds along the hillside west of Castaic Creek.

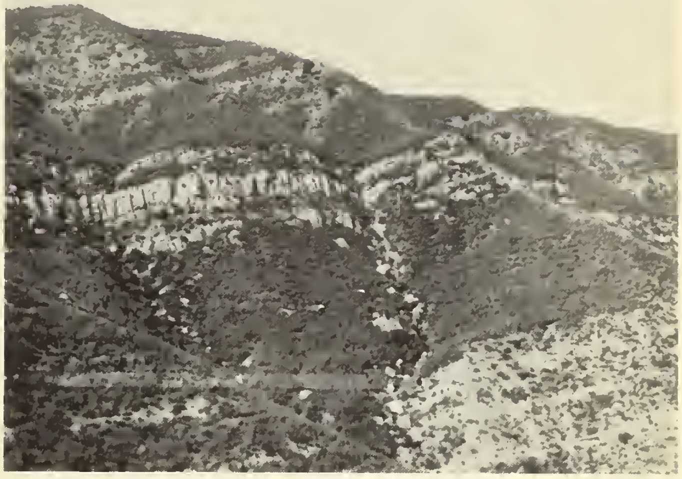


Figure 6. Exposure of Ridge Route sandstone and siltstone beds along the hillside west of Castaic Creek.

fresh-water and brackish-water ostracods and a few fish bones, but otherwise appears to be devoid of fossils. The age of the formation, therefore, cannot yet be determined precisely on paleontologic grounds. However, it rests conformably on Modelo beds of probable Mohnian age, so that the lowermost continental beds may well be Delmontian in age. The beds might therefore be classed as latest upper Miocene or early Pliocene.

The Ridge Route formation crops out in the northwestern part of the area, and extends over approximately a quarter of the area mapped. The rocks resemble the underlying marine strata in lithology and general appearance. The contact between the formations is gradational, and is difficult to locate in the field. Although the two units are not readily differentiable by inspection, some lithologic features help to distinguish them. The non-marine sandstones generally are sandier, coarser, and thicker than the Modelo sandstone beds. They also contain many more lenses and stringers of pebbly conglomerate, which are more continuous, more massive, thicker, and in general have greater resistance to erosion than those in the Modelo formation. The topography of the continental beds is more rugged and includes ridges of greater relief than those in the Modelo beds. As a result, the non-marine sandstone beds can be traced more distinctly and reliably on aerial photographs than the marine beds.

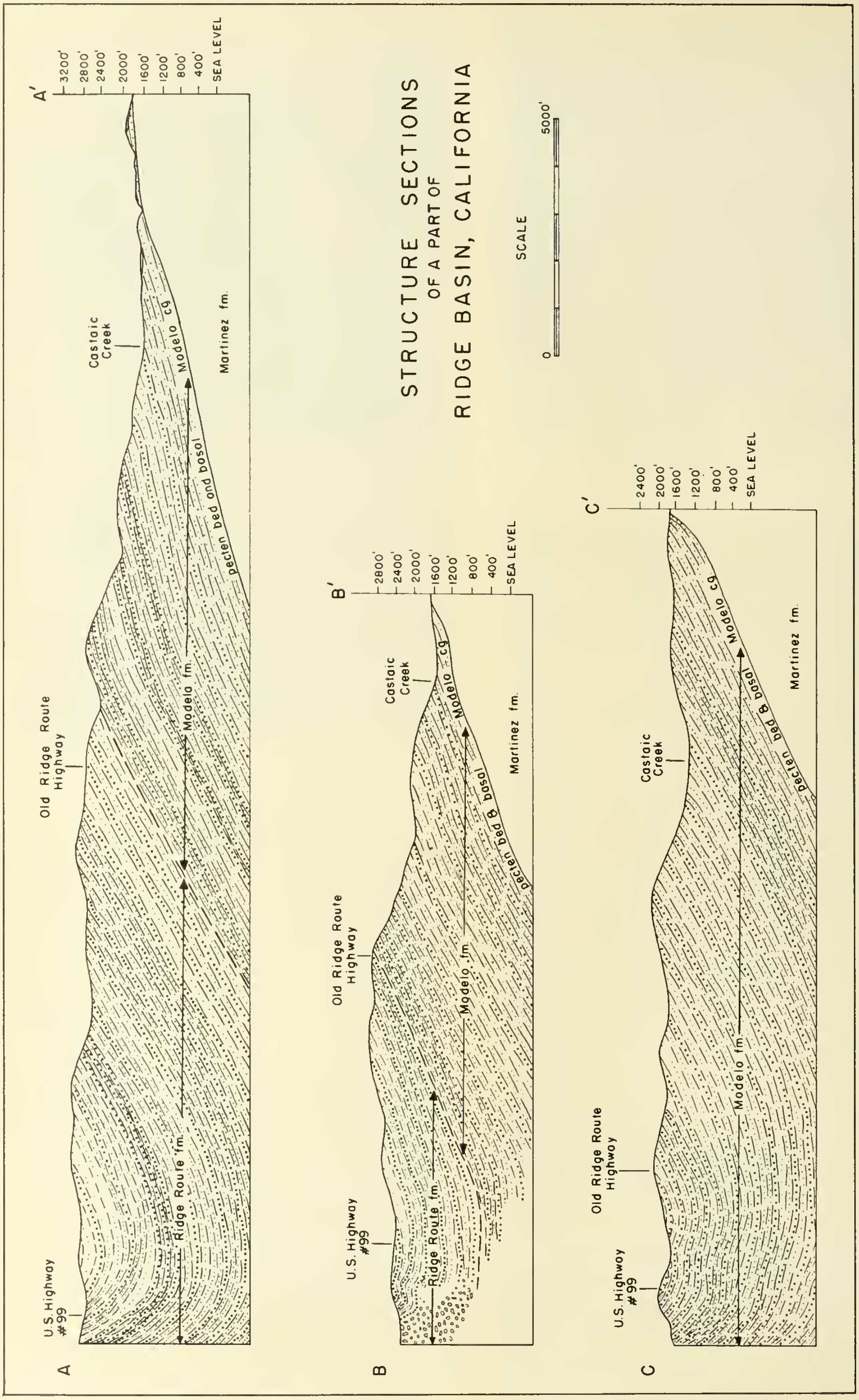
Shale beds are rare in the non-marine series exposed in this area, but siltstone layers, many of them thinly bedded, are common. Most of the Ridge Route formation in the southern Ridge Basin has been weathered considerably and has a more friable appearance than either the younger part of this formation or the underlying marine beds.

The color of the Ridge Route sandstone is similar to that of the Modelo sandstone, ranging from buff to tan, brown, and drab. The non-marine siltstone beds are generally a little darker than the sandstones. Gypsum seams, observed in many of the Modelo beds, are rare in the lower part of the continental section. Like the Modelo strata, the Ridge Route beds consist primarily of subangular quartz fragments, with numerous biotite flakes and feldspar particles. In contrast to those in the Modelo sandstones, the average quartz fragment of the Ridge Route sandstone appears larger, and the biotite flakes are more abundant. The angularity of the fragments in the two formations is similar. The two units appear to have been derived from similar sources, or possibly even the same source.

The Ridge Route beds have been folded concordantly with the underlying Modelo strata into the northwestward plunging Ridge Basin syncline. Although the east limb of the fold was the primary object of this study, the non-marine strata are so markedly different on the two flanks of the fold that a brief lithologic description of the beds on its west flank seems desirable.

About 1000 to 2000 feet west of the synclinal axis, in the vicinity of Canton Canyon, a section of sandstone and siltstone beds similar to those of the east flank of the fold passes abruptly into a thick, steeply dipping series of massive, poorly bedded conglomerate. Clements (1932, 1937) indicates that these beds extend westward, with a steep dip, to the San Gabriel fault. The boulders in the conglomerate are subangular and range in size from a few inches to about 3 feet. They consist of granitic, dioritic, and gneissic rocks, which probably were derived from highland areas that existed west of the fault during much of the time when rocks of the Ridge Route formation were being deposited. No extensive conglomerate beds are present east of the synclinal axis in the area studied, although rather thin lenses of conglomerate occur within the sandstone section. Pebbles in these conglomerate beds, generally less than 3 inches in diameter, are fairly well rounded and consist of sandstone, quartzite, and some granitic rocks. These clasts probably were derived from the highlands northeast of the area, as they are similar to those found in the Martinez beds.

Near the base of the non-marine section, along the old Ridge Route highway, fossil mud cracks and thin layers of silt evidently represent the drying-up stages of a water-laid deposit. In its initial stage of deposition, the Ridge Route formation apparently was covered by water only intermittently, and may well have been of fluvial



STRUCTURE SECTIONS OF A PART OF RIDGE BASIN, CALIFORNIA

FIGURE 7.

origin. A lacustrine origin is suggested for beds only a short distance above the base of the formation, however, mainly by the presence of ostracods (probably of fresh water affinities) and by the general continuity and lithology of the beds. Both Clements (1932, 1937) and Eaton (1939) have interpreted the formation as a lacustrine deposit.

Thicknesses of individual sandstone layers in the non-marine section generally range from a few inches to about 20 feet, and some of the largest sandstone beds are more than 50 feet thick. The beds appear to be continuous and remarkably constant in thickness within the area studied. The formation thickens in a northerly direction as a result of overlapping beds. This suggests either a northwesterly shift in lake deposition, a uniform sinking of this part of the basin during the deposition of the Ridge Route formation, or a gradual rising of the lake level.

Nowhere in the field was either a sharp contact or an interfingering of beds between the marine and non-marine formations observed. However, interfingering of beds should not be ruled out, because of lack of sufficient exposures in the field. A gradational zone, consisting of brackish water and possibly fluviatile deposits, does appear to exist between the marine and lacustrine beds. This zone could not be completely isolated in the field, again because of the lack of sufficient exposures. It is estimated that the thickness of the beds lying between the marine and lacustrine parts of the section is about 50 feet.

The Ridge Route formation, as exposed in the area of study, consists of about 5050 feet of sediments. A brief description of this section follows:

1000′	Sandstone separated by siltstone beds.
400′	Siltstone with interbedded sandstone.
1250′	Sandstone with interbedded siltstone, forming the hillside west of Big Oak Flat.
1150′	Siltstone interbedded with sandstone, several beds of which form ridges. The unit forms the approximate dip slope on the east side of Big Oak Flat.
550′	Sandstone with interbedded siltstone.
150′	Siltstone with interbedded sandstone.
500′	Thick pebbly sandstone, containing numerous siltstone beds.
50′	Gradational zone between marine and lacustrine beds, containing many conglomeratic lenses.

Stratigraphic units higher in the Ridge Route formaion are exposed north of the area, particularly along the old Ridge Route highway and along U. S. Highway 99.

Stream Terraces and Alluvium (Quaternary)

Stream-terrace deposits cap many of the ridges in the vicinity of Castaic Creek. The deposits consist of unconsolidated and poorly bedded gravels that vary in composition. The beds are subhorizontal, and range in thickness from a few inches to 150 feet or more. The thickest errace deposit in the area is exposed at the junction of Castaic Creek and Elizabeth Lake Canyon. The elevations f the preserved remnants of terraces range so greatly hat correlations are difficult to make, but the deposits ndicate that the Castaic stream once flowed at a higher evel than the present floor of the southern part of the anyon. Many stages in the downward cutting of the tream are indicated.

Alluvial deposits form the floors of all the larger canons and extend toward the heads of the smaller ones. bout 80 feet of alluvium was logged in a well drilled in Castaic Valley, in the southeastern part of the area. The thickness of the alluvial deposits is not great in most places, however.

STRUCTURAL AND DEPOSITIONAL HISTORY

The dominant structural feature in the area is the asymmetrical, northwest-plunging Ridge Basin syncline. This fold is parallel to the San Gabriel fault, and its axis lies about a mile east of the fault. The west limb of the fold is steep and beds are locally overturned. The east flank dips rather uniformly at about 20 degrees, and numerous resistant beds form prominent ridges.

A minor anticlinal fold is parallel to the Ridge Basin syncline in the vicinity of upper Canton Canyon. Its axis lies about 1000 feet southwest of the main synclinal axis. The anticline extends beyond the boundary of the area and appears to be several miles long. Numerous small folds are present in the vicinity of the main synclinal axis; some of these are recumbent. Many of the minor folds are exposed along U. S. Highway 99.

A northwest-trending anticline lies in the southeastern part of the area, and extends southeastward into the area of the adjoining Red Mountain quadrangle. Members of the 1947 California Institute of Technology geology field camp have shown that it extends southeastward toward Charlie Canyon.

No major faults lie within the area mapped and only a few minor breaks were observed. However, the important San Gabriel fault is less than a mile southwest of the area mapped. The smaller faults have displacements of 15 feet or less, and hence are not shown on the map. Directions of displacement are generally not determinable; several of the faults, however, may be of a strike-slip type, with right lateral type of movement as occurs along the San Gabriel fault.

The upper Miocene sea invaded the southern Ridge Basin from a southwesterly direction, so that initial dips of the Modelo beds were in that direction. The marine transgression presumably was due to a sinking of the region, with possibly a slight southerly tilt over part of the area. In late Miocene time the sinking (and possible tilting) ceased, and appear to have been superseded by a north or northwesterly tilt of the region. The tiltings probably were related to movements on the San Gabriel fault. As the sea receded from the area, streams, probably from a northerly direction, spilled their deposits over the Modelo sediments. Minor fluctuations of the sea could have occurred during this time, although this was not definitely proved because of a lack of exposures. The stream drainage probably was dammed by a northerly tilting of the area, and a large lake was formed in and northwest of the area studied. The presence of Pliocene marine formations south of the Ridge Route formation, in the vicinity of Castaic, suggests that the dam probably was not high. Source rocks for the marine and non-marine formations probably were similar. The marine beds appear to have been derived from highlands east and north of the area, whereas the non-marine sediments appear to have been derived from highlands to the east and west.

Eaton (1939) states that the Ridge Route formation probably was folded in post-Pliocene time. The minor folds in the southern part of the basin probably were formed contemporaneously with the Ridge Basin syncline.

*Table 1. List of holes drilled in southern Ridge Basin.**

Map number	Operator	Well	S-T-R	Date started	Total depth (in feet)	Notes	Status
1	Allen, George	Allen 1	19-5N-16W	6-1951	3700	13′ of oil sand at 250′, 18′ at 900′ and 30′ at 1540.	Aband. 10/1951
2	Pedro Petroleum Corp.	Oates 1	24-5N-17W	1940	2207		Aband. 1948
3	Worland Oil Co.	Jenkins-Owens 1	18-5N-16W	1939	2940		Idle 1941
4	Wilhite, L. R. & Claude Kavanaugh	Wilhite-1 Jenkins	18-5N-16W	10-1947	3489	Bottomed in Miocene?	Aband. 1948
5	Stabler, W. W.	Jenkins 1	18-5N-16W	1925	3404	Bottomed in Modelo.	Aband. 1929
6	Republic Inc.	Fee 1	13-5N-17W	1946	4972		Aband. 1947
7	Continental Oil Co.	Alexander 1	23-5N-17W	9-1951	4851		Aband. 12-1951
8	Los Nietos Co.	Alexander 1	22-5N-17W	2-1951	4051	Ran electric log at 1995′ and 4051′; sidewall sampled.	Aband. 4-1951
9	Continental Oil Co.	Vier-Kenny 1	22-5N-17W	2-1952	4612		Aband. 3-1952
10	British American Prod. Co.	General 41-13	13-5N-17W	1-1952	5818	Formation test with packer 3940′ no oil or water. Plugged 4053.	Aband. 3-1952
11	The Texas Co.	Dairies (NCT-1)	2-5N-17W	2-1951	4794	Ran tester with packer at 4160′ and 4220′, both tests failed. Plugged at 4312.	Aband. 5-1951
12	Daum Drilling Co.	Mary Austin 1	28-6N-17W	12-1950	3646	Oil and gas shows. Plugged 2400′.	Testing on pumps 4-1952
13	Ellsworth, C. W.	Paducah 1	10-5N-17W	1922	?		No records
	Castaic Oil Co.		23-5N-17W	pre-1921	1000		No records
	Castaic Oil Assoc.		18-5N-16W	pre-1921	1400		No records
	Rose Oil Co.		18-5N-16W	pre-1921	1700		No records

* Data complete through May 1952.

Folding in the Ridge Basin is very likely associated with movements along the San Gabriel fault.

Terrace deposits at different stream levels, in some places of considerable thickness, indicate that during Quaternary time streams in the area intermittently cut and filled their channels. Either variations in stream base level or a rising and lowering of the region is thus evidenced during part of the Quaternary period.

GEOLOGIC HISTORY

The following is the apparent chronological order of events in the southern part of the Ridge Basin since middle Miocene time:

1. The sea invaded the area from the southwest during upper Miocene time. It transgressed a land surface underlain by Martinez and Mint Canyon beds, and extended to points at least several miles north of the area studied. During much of Miocene time the region was sinking, with possibly some tilting toward the southwest.

2. A gradual tilting of the region in a north to northwesterly direction during late upper Miocene, probably Mohnian time, resulted in a filling of the sea with silt.

3. Streams from a northerly source spilled their deposits on the Modelo sediments, evidently with no appreciable time lapse between the two periods of deposition. These streams apparently were dammed in the south, thus forming a lake with its main body lying near the center of the Ridge Basin. This lake may have been formed during Delmontian or Pliocene time.

4. The Ridge Basin syncline was formed, probably as a result of movement along the San Gabriel fault, during late Pliocene or Pleistocene time.

5. Minor intermittent changes in base level or elevation of the area occurred during Quaternary time, and resulted in stream-cut terraces and deposition of terrace gravels.

ECONOMIC GEOLOGY*

Clay

The fine-grained siltstone and shale of the Modelo formation provide a suitable source material for the manufacture of brick. The Castaic Brick Company, situated at the mouth of Grasshopper Canyon, near Castaic Valley, is mining the shale and manufacturing red building bricks. The operations, recently taken over by J. W. Gregowd, are capable of producing about 20,000 to 25,000 bricks per day, but an expansion program currently being undertaken will attempt to increase this amount to 65,000 bricks daily. When the deposit was visited in early 1952 a face over a hundred feet high and several hundred feet wide was being advanced westward by power shovel. The formed bricks are burned in field kilns located on the property.

Petroleum

Numerous exploratory holes have been drilled in search of oil within this area over a period of more than 30 years. All of them have been confined to the Modelo formation in the southern part of the area except the "Mary Austin" No. 1 well located about 8 miles north of Castaic, which spudded in the non-marine Ridge Route formation.

The location of 13 holes drilled since 1922 are shown on the map and data on the wells are given in Table 1.

Most of the wells are on a northwest-trending anticline in the upper part of Castaic Valley. Although oil and gas shows have been reported in some of them, none have produced oil commercially.

The "Mary Austin" No. 1 is the northernmost well located in the area. It penetrated the continental beds of the Ridge Route formation and drilling was terminated in marine Modelo beds at 3646 feet. Tight oil sands and indications of gas were reported. Early in 1952 a pump had been installed and attempts were being made to develop a producing well.

About a quarter of a mile east of the area mapped, in Elizabeth Lake Canyon, a small producing well was drilled by the T & M Exploration company. This well, the "Kindler" 1, was completed in 1950 at a depth of 2877 feet.

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* By Charles W. Jennings, Junior Mining Geologist, California Division of Mines.

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OLAF P. JENKINS, CHIEF

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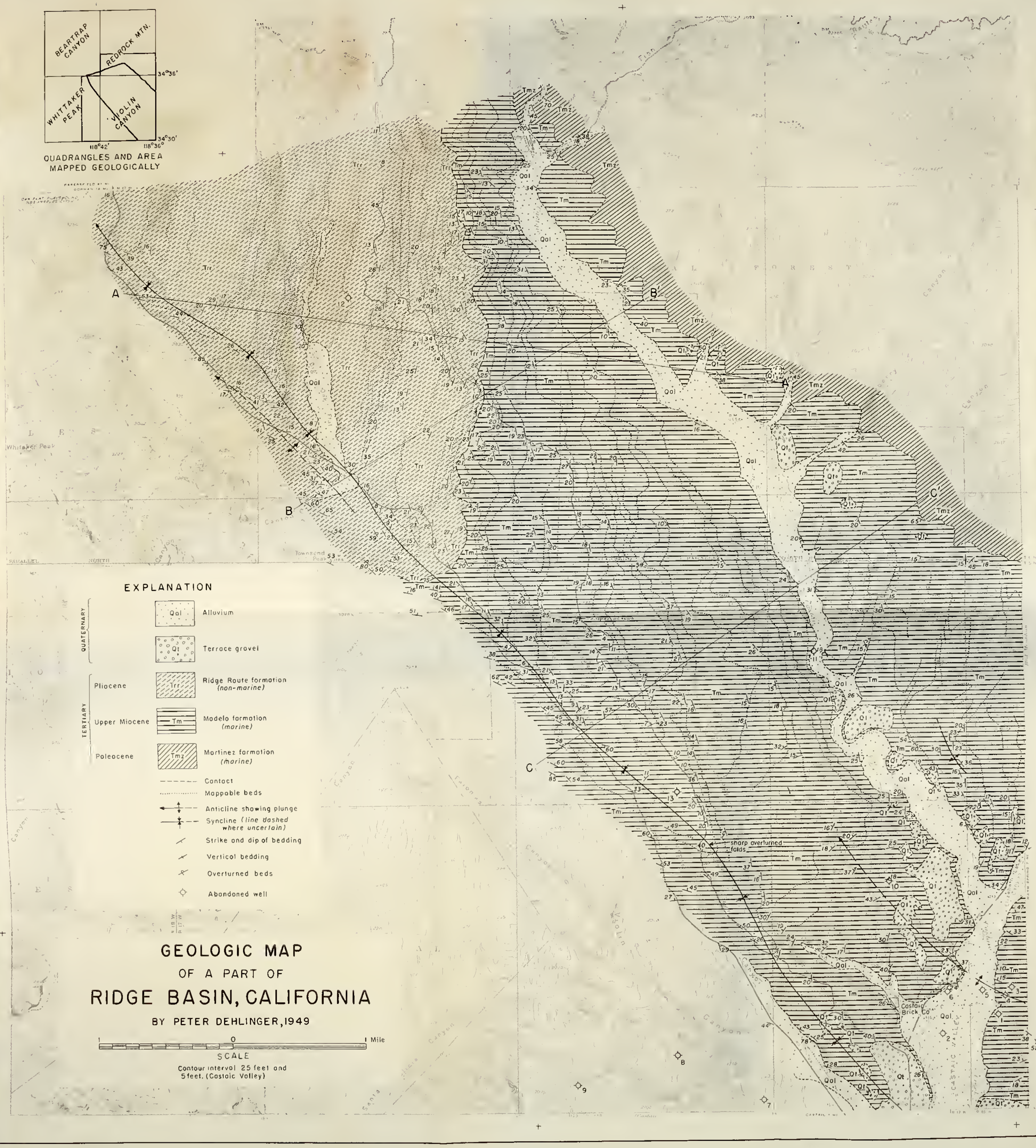
SPECIAL REPORT 26
PLATE I



GEOLOGIC MAP
OF A PART OF
RIDGE BASIN, CALIFORNIA

BY PETER DEHLINGER, 1949

Contour interval 25 feet and 5 feet. (Castaic Valley)